Chapter 4 Measures of dispersions in discrete variables

1) Index of qualitative variable (IQV)

IQV is a measure of dispersion for discrete variables/qualitative variables, such as gender, race, region, religion (nominal or ordinal variables).

2) Formula for IQV

$$IQV = \frac{K(10{,}000 - \sum(Pct)^2)}{10{,}000(K-1)}$$

K: total number of groups in the variable, Pct is the percentage of cases in each group.

3) Example

For the following city (Fayetteville AR) racial composition, please compute its IQV

race	Fayetteville AR 2020	Springdale AR 2020	Fayetteville AR 2010
White	74	41	81
Black	6	2	6
Asian	3	2	3
Hispanics	9	35	6
Others	8	20	4
IQV	54%	84%	42%

$$IQV = \frac{K(10{,}000 - \sum(Pct)^2)}{10{,}000(K-1)} = \frac{5(10{,}000 - (74^2 + 6^2 + 3^2 + 9^2 + 8^2))}{10000(4)} = 54\%$$

4) Interpretation of IQV

$0 \leq IQV \leq 1 \text{ or } 100\%$

When IQV is closer to 0, it means the cases are concentrated in one group. When IKQV is closer to 1 or 100%, it means that the cases are well dispersed across different groups in the variable.

5) Fayetteville AR is more racially diverse in 2020 than it was in 2010. Springdale AR is more racially diverse than it is in Fayetteville AR.

6) When to use what

	Nominal variable	Ordinal variable	Interval/ratio variable
IQV	Yes	Yes	Yes
S^2	No	No	Yes
S	No	No	Yes